



eden project

162/14-034

'A Biodiversity Conservation Training Programme for the Yabotí Biosphere Reserve'

Misiones, Argentina



Darwin Initiative Annual Report No 1, April 2006
A biodiversity conservation training programme for the Yabotí Biosphere Reserve

Project Ref. Number	162/14-034
Project Title	A Biodiversity Conservation Training Programme for the Yabotí Biosphere Reserve
Countries	Argentina
UK Contractor	Eden Project
Partner Organisations	University of Misiones (Faculty of Forest Sciences), Darwinion Botanical Institute, UNDP, Ecological Investigation Laboratory Las Yungas, National University of Tucuman (LIEY)
Darwin Grant Value	£141.130
Start/End Dates	1 st April 2005 to 31 st March 2008
Reporting Period	1 st April 2005 to 31 st March 2006
Project Website	www.edenproject.com/darwinargentina
Author(s), date	Ghilleen Prance, Daniel Ryan, Mario Malajovich

Project Background

Fulfilling an agreement between the British Embassy in Buenos Aires and the Misiones Government, the FCO in 2000 asked the late Dr Marcio Ayres to investigate a cooperation programme. He proposed building a field station and appointed an International Advisory Committee to support the endeavour. This project, based in the Yabotí Biosphere Reserve, is an important follow up to that work.

Misiones remains largely forested, but has suffered from huge levels of fragmentation over the past one hundred years or so because of deforestation and the plantations of pine, tobacco and agriculture that follow in its wake. These beautiful forests are a significant remnant of the Atlantic Forest, which once flourished over SE Brazil, Paraguay and Misiones and it is estimated only 5% now remains of this global biodiversity hotspot. This region is ranked among the top five of the 25 global hotspots, a measure determined by factors including species density, diversity and levels of endemism. The survival of the Misiones forest, which is the greatest unfragmented sector, is critical in a very global sense.

Yabotí Biosphere Reserve was established in 1995 and is a UNESCO Man and Biosphere (MAB) reserve. Yabotí is approximately 250,000 hectares and has a 30,000 hectare Provincial Park, Esmeralda, at its core. Esmeralda is the focus of project activity. Yabotí is not presently fragmented, but is threatened by illegal logging and poaching. These threats have major biodiversity implications, and, perhaps more importantly, significant social implications. The Guaraní people who have lived in these forests for thousands of years are being forced into smaller, less

productive home areas and their livelihoods have been, and will continue to be, diminished by ongoing forest destruction. Other biodiversity threats are caused by the encroachment of invasive weeds, such as bamboo. Bamboo control is another significant activity of the project.

However, there is hope on a number of counts. Consensus exists between the Government and Misiones population about the importance of its preservation and legislation that gives some protection to 40% of their remains. There is also a growing and formal recognition of the rights of the indigenous people and there are experienced scientists working in the region.

In spite of these favourable conditions there is no articulation between the principal players to foster the implementation of policies to preserve the forest. This programme aims to articulate these favourable but disparate elements through training local scientists in biodiversity conservation (including restoration, botanical and ethnobotanical inventories and zoological studies) and improving the capacity for further research - ultimately producing a sustainable management plan for the reserve and encouraging an institution sheltering these activities.

Project Purpose and Outputs

A strategic sector of the threatened Atlantic Forest protected through a permanent programme of research, training, fieldwork, management plan and Guaraní empowerment in the Yabotí Biosphere Reserve.

The outputs to achieve this purpose are thus:

- Institutional framework agreement between staff members and MINEC (Ministry of Ecology)
- Funding arrangements agreed
- Equipping of the field station
- Inventory of plant species and FacFor (Faculty of Forest Sciences, University of Misiones) herbarium improvement
- Accumulated data made available on internet through IRIS database
- Ethnobotanical studies with Guaraní people, integrated to qualified roles, livelihood improvement
- Techniques of restoration and bamboo control produced. Biodiversity assessment and monitoring programme in place
- Education, training and wide-reaching dissemination of information. Including four courses taught in Argentina and four FacFor staff travel to Kew and Eden Project
- Management plan for Yabotí Biosphere Reserve produced
- Exhibit produced at the Eden Project

See appendix 1 for copy of Logical Framework

The outputs or proposed operational plan have not been modified over the last year. In order to account for some slippages in the first year activities it may be deemed necessary to slightly modify the activities in the second year.

Progress

Prof Ghillean Prance assumed leadership of the Yabotí Biosphere Reserve advisory committee in 2003 following the untimely death of Marcio Ayres. Prof Prance visited Yabotí in 2003 and proposed a Darwin Initiative project. After an unsuccessful main project application in 2004, pre-project funding was used to build and prepare a secure project. The main grant application in 2005 was successful. Progress in the first year has, in the main, been good. The partner base is widening and strengthening and the activities undertaken are proving successful. Some issues have arisen over the UNDP cooperation in the handling of the Argentinean finances leading to a more confused financial system than was envisaged. There was also an overestimation of the financial needs for UK participants in Argentina during the reporting period.

A summary of progress so far

All plant collecting for herbarium specimens and databases has been completed in line with project timetable. The same is true with the fauna studies, which have exceeded the projected work, producing interesting findings submitted to the scientific literature.

One key Argentinean project member undertook an eight week training course in the UK. The lack of another suitable, available candidate meant slippage in this instance. In other cases the projects existence has allowed many more students to undertake work in Yabotí that previously would have been unavailable. This increased capacity is a positive sign for the future of research within the reserve and hopefully will lead to increased protection and enhancement of the ecosystems.

The bamboo removal programme is being re-assessed owing to the flowering episode of late 2005, which may allow increased integration of the bamboo situation into the overall restoration plan, providing a significant opportunity for the project. The key restoration plots have been identified and protocol established through FacFor, although some modification will follow based on field trips by Eden staff. Meanwhile, 60km of old logging trails in Esmeralda were re-opened for use by the project team and park rangers.

Using a very intelligent Guaraní informant, good relation building with the local communities has improved the already extensive ethnobotanical work undertaken. He, Rosalino Duarte, will also be supported through park ranger school. In addition 33 Guaraní have been hired as informants and 10 as field assistants. This process was significantly enhanced by the three weeks Prof Prance spent in the field with the Guaraní, scientists and park rangers.

Some degree of course structure for FacFor is in place and being developed. The major elements of the taught courses in Argentina will follow in years two and three. Initially, a multi teacher ethnobotanical course will occur in late 2006 and there will be seminars relating to ecological restoration during the same period.

The IRIS database has been enhanced through three collection trips to Misiones by staff and students from the Darwinion Institute. Findings have been published and others are awaiting publication. The fauna studies have been very successful and integrating of other zoologists' means this work will become an increasingly important aspect of the project.

Dissemination has been wide-ranging. There have been published articles (and others submitted), talks have been given to Eden staff, although not yet to the Eden friends membership group. There have been no radio broadcasts in the UK.

Project achievements during the last year

The achievements and activities over the reporting period are hopefully contributing to a very effective overall project. Beatriz Eibl, a researcher at the Faculty of Forest Sciences in the University of Misiones, spent eight weeks on the renowned RBG, Kew Plant Conservation Strategies course. Beatriz is instrumental in the Yabotí restoration work being carried out as she manages the seed collection from the 'perfect' trees, seed storage and the seed use in restoration work. A product of the training course was a report forming the basis of further ongoing restoration work. Dr Peter Whitbread-Abrutat, an ecological restoration specialist, will work in Yabotí in October 2006 with Beatriz and give taught courses and seminars to relevant students and researchers from the University.

Darwin Initiative funding has allowed the Instituto de Botanica Darwinion, led by Dr Fernando Zuloaga, to compile an inventory of Misiones plants. The inventory to date can be found on the IRIS database hosted by the Darwinion Institute at: (www.darwin.edu.ar/Proyectos/FloraMisiones/MIS.asp). The funding was used to purchase computer equipment to facilitate the inventory and researcher time for collection and data input. This intuitive database will be an invaluable monitoring tool and as a resource for future researchers and the Darwin Initiative contribution is noted.

The fauna studies, led by Dr Mario DiBitetti, have progressed very well with the equivalent of 3,105 camera trapping days at 57 different stations carried out. 1,920 photographic records of 37 vertebrate species were collected, including four images of a lone jaguar (a selection of these images can be found in appendix 5). Important information on the absolute and relative abundance of most large and medium size mammals in the reserve was also gathered. This is unique work to Yabotí and is, thus, highly significant. Funding from Darwin also allowed undergraduates working with DiBitteti to carry out new research.

Prof Prance spent three weeks working with Hector Keller, the Guaraní communities and other staff members of the University guiding their research and using his exceptional experience to bolster the ongoing project work. Many specimens were collected during this visit, which will enter the herbariums at the University of Misiones and Corrientes in Argentina and at the Royal Botanic Gardens, Kew. This taxonomic classification, coupled with the IRIS database, is forming a firm scientific foundation on which to build the intellectual capacity in Yabotí. Prance was also instrumental in engaging the politicians in the process of forest protection and spent the final few days of his field trip in this role. A new agreement was signed between the Provincial Government, National University of Misiones and the Eden Project to continue working together towards a sustainable future for the forest and promoting a new academic institution the shelters biodiversity conservation studies. However, time will tell how concrete this political will is.

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Land use and ownership issues still rage, amplified by the exhaustion of local forest and pressure from illegal agriculture (mainly tobacco). These conflicts have erupted because of MINEC actions to introduce logging controls and attend to Guaraní claims of damage inferred by unsustainable logging. There is also significant disagreement between the commercial and small-scale (often illegal), plantations, which the Government could help resolve.

Significant difficulties surrounding the project revolve around some easily rectifiable issues and some more complex situations. The complexities focus on politics, land ownership, occasional lapses in project partner activities and the financial machinations of the project.

The design of the project has not been enhanced during the last year. However, owing to complications it has been necessary to vary the UK staff visits during this period. This means that Dr Whitbread-Abrutat will now work in Misiones in Oct 2006 rather than in 2005. Jamie McCormack of Eden Project and an expert on the genus *Araucaria* (Misiones is renowned for the Cites red list species *A. angustifolia*), accompanied Dan Ryan on this trip and project locations were visited, assessed and the restoration protocol, both in place and proposed, were discussed. Seminars were given at FacFor relating to the overall project and workshops conducted for the University of Misiones forestry and botanic garden staff.

Timetable for the next reporting period:

Quarter	Project activity description (some are common to all quarters)
Apr - June	Project planning and establishment of firmer protocols regarding the distribution of funds. Aerial photographic survey of YBR. Interpretation of photos, preliminary entry onto GIS. Continue the equipping of the field station and continued training of field station staff and clarification the conditions to be fulfilled by foreign investigators. Planning for field visit and meeting of the International Advisory Committee in October.
July – Sept	Bolster the use of the field station by local and, hopefully, global scientists. Plant collection, bibliographic and herbarium revision, specimen identification – further establishment of study sites. Establish new protocols for bamboo control (the flowering of <i>Meristachys</i> bamboo in the reserve has given a significant opportunity to transform the heavily invaded areas. However, if the new protocol fails then with increased forest disruption since the last flowering event (approximately 30 years ago) there the possibility that the invasion could be worse than before. Planning of Ethnobotanical training courses in the University. Identify suitable courses and candidates for Argentinians to attend either in Argentina or globally. Forest restoration work continues and planning for visit by ecological restoration scientists in Oct.
Oct – Dec	Seed studies and restoration: restoration areas selected, identification of study plots, restoration methods identified, restoration and recuperation work. Workshops held with student Ranger school. Ongoing work with Guaraní communities relating to ethnobotany and livelihood opportunities. 4 Guaraní trained and assisting in flora and fauna protection. Meeting of the International Advisory Committee. International course in ethnobotany. Local staff assisted to Forest Conference in UK. Carry out ethnobotanical course at FacFor
Jan - Mar	Institutional framework for Biodiversity Research Institution completed. Follow up on recommendations resulting from evaluation by the advisory committee. Ongoing restoration, biodiversity assessment and taxonomic work. Ongoing work with Guaraní communities relating to ethnobotany and livelihood opportunities.

Partnerships

In general the partnerships have worked as envisaged. In most cases the partnerships have exceeded expectations in terms of strengthening the project and allowed many introductions to potential collaborators. However, there are areas where the project has been let down in terms of institutional building delays. It is hoped a Biodiversity Research Centre will be created able to foster research and studies relating to the Misiones biodiversity. This centre would fulfil the institutional needs of the project and would ensure its impact and sustainability. It is hoped this can be initiated at the next meeting of the Advisory Committee in October 2006. The biggest single issue has been in the distribution of funds. Initially, Eden agreed to divert funds for use in Argentina to the UNDP who would carry out the Argentinean partner organisations funding distribution. However, the lack of an independent legal body impeded this process and made the use of UNDP as a major driver difficult. So, the Eden Project has been diverting funds to the individual project partners. Another problem has been the lack of identification of suitable courses and participants in the last year. Therefore, increased effort will be made to ensure these training outputs are met in the coming year.

The existing partners have evolved and many new introductions have been sourced through the partner network. New partners who will be able to substantiate the project work are a network of scientists, Ceiba, based at Iguazu. A member of Ceiba, Dr Norma Hilgert, an ethnobotanist, has been identified as a future likely project team member. Future collaborations with Dr Hilgert will include ethnobotanical seminars and taught courses at the University of Misiones in 2006 and presenting about ethnobotanical research in Yabotí at Eden's Rainforest Gathering conference in October 2006. Correspondence with other Atlantic Forest (non Darwin) projects has occurred and may lead to future collaborations.

It is hoped that through the members of the advisory committee further substantial partnerships will also arise. A member of the advisory committee, Dr Christine Padoch, a highly respected anthropologist from New York Botanic Garden, is likely to assist in these ethnobotanical courses.

Impact Sustainability

The project profile within the host country is strong. The local provincial Government has been exposed to the project on many occasions and there has been significant coverage in the local media. Regional exposure takes precedent to national exposure as this forest system is restricted to Misiones. Every effort to promote the project has been afforded ranging from public meetings to press conferences.

There is significant evidence to suggest that interest and potential further capacity building will result from the project. However, this evidence is hard to quantify. Public awareness of the project appears to be growing and it features regularly in the Misiones press (see output table 1 for details).

The same exit strategy remains as in the original project proposal. If it is necessary to alter this during the project life then this will be addressed. Avenues that may open up and alter the exit strategy are the opportunities for purchasing land in the biosphere reserve and the involvement of American and other International conservation organisations via links with the advisory committee. Of course, further opportunities may arise during the lifespan of the project.

Outputs, Outcomes and Dissemination

There are some differences between predicted and achieved outputs. Output 6A was only partly achieved owing to the lack of a second suitable candidate available at the time of the course. The aim is to recompense this in the second year. Under output 4A there were no official taught courses as predicted. These will occur in years 2 and 3. However, there was significant undergraduate and postgraduate training that occurred in its place. And on the ground fieldwork and training has proved to represent a larger element than predicted. This is in part owing to the successful completion of the field station within Yabotí.

The flowering of the bamboo in Yabotí has meant delaying bamboo clearance while new protocol is established. It is still envisaged that local communities will assist in this work. The forest restoration work has assumed a protocol based on the training received on the RBG, Kew botanic conservation course. Allied to the bamboo flowering episode this means that while there are still core restoration sites it may be possible to closer fuse the bamboo clearance and forest restoration work.

The aerial survey has been postponed to allow a clearer view of the areas suffering from bamboo intrusion, which is now dying back. However, there are many elements where the outputs have been exceeded and extra outputs achieved. Exceeded outputs particularly fall into the categories 11B as seven papers have been submitted for peer review. The fauna elements of the project have also taken a greater role than initially envisaged and the camera traps have proved very successful. This information coupled with the increasing botanical knowledge will prove very useful for the project and as a legacy.

Dissemination activities in the host country have been extensive. Many articles have appeared in the local press as a direct result of project activity, press releases or press conferences. The good relationship with the local media, which is a valuable communication tool with the people of Misiones, should ensure reporting of the issues will continue in this vein.

Table 1. Project Outputs (According to Standard Output Measures)

Code No.	Description	Year 1	Year 2	Year 3	Year 4	TOTAL
		Total	Total	Total	Total	
4A	6 undergraduate students (4 working under Zuloaga at Darwinion and 2 under DiBitetti) fieldwork is being enabled by the improved infrastructure as a result of the project	6				
4C	4 graduate students work is being enabled by the project grant (working with Zuloaga on vascular Misiones flora)	4				
6A	One Argentinean completes eight week RBG, Kew plant conservation course - summer 2005	1				
8	Seven weeks in field by UK staff	7				
11	Paper published in peer review journals.	1				

- Zuloaga, F.O. & Morrone, O. 2005. *Revisión de las especies de Paspalum para América del Sur Austral (Argentina, Bolivia, sur de Brasil, Chile, Paraguay y Uruguay)*. *Monogr.. Syst. Bot. Ann. Missouri Bot. Gard.* 102: 1-297.
- 11B Papers submitted to peer reviewed journals: 7
- Keller, F. for 'Kurtziana' entitled: 'Estudios etnobotánicos en una comunidad Mbya Guaraní de Misiones, Argentina. Metodología para determinar la diversidad de recursos de la vegetación.'
- Paviolo, A., De Angelo, C. Di Blanco, Y., Ferrari, C. Di Bitetti, M., Benhur Kasper. C., Mazim, F., Soares, J. B. G. & Gomes de Oliveira, T. for Cat News, the newsletter of IUCN's Cat Specialist Group entitled: 'Crossing the border: The need of transboundary efforts between Argentina, Brazil and Paraguay to preserve the southernmost jaguar (*Panthera onca*) population in the world.'
- Di Bitetti, M. S., Paviolo A., De Angelo, C. & Di Blanco, Y. for: *Journal of Tropical Ecology* entitled: 'Ecological correlates of the daily activity patterns of the mammal community of the Atlantic Forest of Misiones, Argentina.'
- Ferrari, C., Di Bitetti, M. S., Paviolo A., De Angelo, C. & Di Blanco, Y. for *Conservation Biology* entitled: 'Differential responses to hunting by humans in two sympatric species of brocket deer (*Mazama americana* and *Mazama nana*) in the Atlantic Forest.'
- Zuloaga, F. O., Morrone, O., Davidse, G. & Pennington, S. J. 2006. For *Aliso* entitled: *Classification and biogeography of the Panicoideae in the New World. Proceedings of the Fourth International Symposium on Grass Systematics and Evolution, Claremont, California.*
- Morrone, O., Escobar, E. & Zuloaga, F. O. 2006. for *Annals of the Missouri Botanical*
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	<i>Garden entitled: 'Chromosome studies in American Panicoideae (Poaceae).'</i>	
	<i>Freire, S., Katinas, L., Iharlegui, L., Giuliano, D., Gutiérrez, H., Sancho, G., Delucchi, G., Bayón, N., Urtubey, E. & A.A. Sáenz. 2006. for Darwiniana</i>	
	<i>entitled: 'Catálogo de la familia Asteraceae en la provincia de Misiones.'</i>	
12B	<i>IRIS database enhanced and available for widespread use in host country</i>	1
13B	<i>Triplicate herbarium collections (180 species) of Yabotí flora made by GT Prance, H Keller and R Duarte for the Universities of Corrientes, Misiones and RBG, Kew</i>	3
14A	<i>Press conference and public meeting, 01/06 (see appendix 3) Seminar and workshop at Faculty of Forest Science, University of Misiones Feb 2006.</i>	2
14B	<i>Papers presented at scientific and public meetings (see appendix 2 for details)</i>	7
15A & 15B	<i>13/1/06, Misiones Online: 'Científico Ingles realiza un relevamiento de la selva misionera'</i> <i>26/1/06, Misiones Online: 'Jacobo se reunira con científicos ingleses'</i> <i>29/1/06, El Territorio: 'ONG Britanica realizara estudios en Yaboti'</i> <i>30/1/06, Misiones Online: 'Ecología y ONG Britanica investigaran en Yaboti'</i> <i>30/1/06, Misiones Online: 'Gran Bretana colaborara en la preservacion de Yaboti'</i> <i>31/1/06, Primera Edicion: 'Investigaciones y estusios con apoyo'</i> <i>4/2/06, El Territorio: 'Taller sobre conservacion de Jardin Botanicos'</i> <i>6/2/06, Misiones Online: 'La selva misionera podra ser visitada en Inglaterra'</i> <i>7/2/06, Misiones Online: 'Proyecto Eden'</i> <i>14/2/06, El Territorio: 'El famoso etnobotanico ingles es uno de los protectores do Yaboti'</i> <i>28/3/06, Argentina Forestal:</i>	11

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15C & 15D	<p><i>'Cientificos ingleses haran una replica de la selva misionera en Eden Project'</i></p> <p>Eden Friends Magazine: 'A forest under threat: does Darwin hold the key?' CD Ryan, Spring 2005 – circulation 6,000</p> <p>Eden Friends Magazine: 'A visit to the Yabotí Biosphere Reserve' GT Prance, Summer 2005 – circulation 6,000</p> <p>Eden Friends Magazine: 'A future for the forests of Misiones?' CD Ryan, Winter 2005 – circulation 6,000</p> <p>Article submitted and accepted to conservation magazine 'Plant Talk' for future publication: 'Argentina's forgotten fraction' CD Ryan, 2006 – circulation 2,000</p>	4
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Table 2: Publications

Type * (e.g. journals, manual, CDs)	Detail (title, author, year)	Publishers (name, city)	Available from (e.g. contact address, website)	Cost £
Magazine	'A forest under threat: does Darwin hold the key?' CD Ryan, 2005	Eden Project	Eden Project, Bodelva, Cornwall PL24 2SG	Free
Magazine	'A visit to the Yabotí Biosphere Reserve' GT Prance, 2005	Eden Project	Eden Project, Bodelva, Cornwall PL24 2SG	Free
Magazine	'A future for the forests of Misiones?' CD Ryan, 2005	Eden Project	Eden Project, Bodelva, Cornwall PL24 2SG	Free

Project Expenditure

Table 3: Project expenditure during the reporting period (Defra Financial Year 01 April to 31 March)

Item	Budget (please indicate which document you refer to if other than your project schedule)	Expenditure	Balance
	1,150	1,150	0

Monitoring, Evaluation and Lessons

Long term monitoring and evaluation is in some respects an easier prospect than shorter term evaluation of small components of the project purpose. In the long term increased forest protection, maintained or improved biodiversity, and better livelihood opportunities for the Guaraní will be the key monitoring factors. However, in the short term there are indicators that demonstrate the outputs and activities are contributing to the project purpose.

Many lessons have been learnt over the course of the year. Owing to the slightly slower transition of money from the UK to Argentina it has led to reconsideration of the process for fund transfers. It was learnt we overestimated the funds required for UK participants travel and subsistence and this knowledge can be built into future plans, possibly allowing for more UK participants to train Argentinians and contribute to the projects overall success. Further, in hindsight, the set-up and initiation of project activity took too long. Improved initial planning and contingencies would have countered this and is a valuable lesson for the remaining years of the project.

Outstanding achievements of the project during the reporting period

Through the work of the team from CIEY (who comprise members of Vida Silvestre, CEIBA and the Laboratory of Functional Ecology, Las Yungas) the Darwin Initiative grant purchased several motion sensitive camera traps for fauna monitoring in Yabotí. The products of the initial research were some spectacular images, the like of which have rarely been seen in Misiones. These images give an invaluable insight into the distribution, behaviour and populations of many species of forest megafauna including jaguar, ocelot, puma, peccary, tapir, tamandua and yacutinga. 37 vertebrate species in total were captured on film, over the equivalent of 3,105 camera trapping days, including four images of a lone jaguar - 'Patudo'. This solitary male gives some cause for concern and as he was recently spotted in nearby Brazil a lack of territorial competition from other males is suspected. None of this work would have been possible in Yabotí without the existence of the field station in Esmeralda and the improved capacity created by the project.

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Annex 1 Report of progress and achievements against Logical Framework for Financial Year: 2005/2006

Note: Please do NOT expand rows to include activities since their completion and outcomes should be reported under the column on progress and achievements at output and purpose levels.

Project summary	Measurable Indicators	Progress and Achievements April 2005-Mar 2006	Actions required/planned for next period
<p>Goal: To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but poor in resources to achieve</p> <ul style="list-style-type: none"> • The conservation of biological diversity, • The sustainable use of its components, and • The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources 			
<p>Purpose A strategic sector of the threatened Atlantic Forest protected through a permanent programme of research, training, fieldwork, management plan and Guaraní empowerment in the Yabotí Biosphere Reserve (YBR)</p>	<p>Improvement in habitat and species composition knowledge. Forest restoration and bamboo control procedures</p> <p>A stable scientific staff stewarding a well equipped and funded field station assisting MINEC in biodiversity conservation</p> <p>Proposed changes adopted in FacFor graduate and rangers school curricula</p> <p>At least 2 Guaraní villages empowered through the partnership, and its income level raised by at least 20%</p> <p>Public awareness campaigns about</p>	<p>Species composition knowledge improved and taxonomic samples collected and collated. No significant habitat improvement but unexpected bamboo flowering episode in late 2005 means differing measures have to be taken</p> <p>Field station well equipped and used increasingly by local scientists. Full time park guard employed to staff field station</p> <p>Guaraní villages and key persons identified</p>	<p>Must identify new means of bamboo control based on recent flowering event. This is a significant opportunity. Continue detailed species composition work</p> <p>Increase use of field station by international scientists and eco-tourists. Complete equipping. Implement institutional framework</p> <p>Necessary to identify suitable changes in curricula to best train local professionals</p> <p>Establish best means to empower local Guaraní using trained Guaraní informants and new livelihood opportunities</p>

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	Misiones forests in Argentina and UK One person obtains PhD as direct result of project work	Significant media attention in Argentina generated as a result of the project PhD work is successfully being undertaken	Aim to maximise the projects public awareness by means of a layered, diverse approach Further integrate PhD work into project legacy and ongoing research
Outputs			
Institutional framework agreement between staff members and MINEC	Agreements reached	Institutional framework formalised in a cooperation agreement signed by the Eden Project, MINEC and the University of Misiones to generate an academic and research institute dedicated to biodiversity	The initial objective of generating an institutional framework based in the field station miscalculated the necessity of critical mass. The legal status and additional resources will be procured for this more sustainable and ambitious endeavour
Funding arrangements agreed	Funding obtained	A grant of US\$70,000 assigned by UNDP, and a match of US\$35,000 by Misiones Government	
Equipping of the field station	Equipment incorporated	Equipment to the value of US\$ 35,000 bought with UNDP funding	Use the remaining funds and complete the field station facilities
Inventory of plant species and FacFor herbarium improvement. Accumulated data made available on internet based IRIS database	Herbarium collections deposited at FacFor, Darwinion and RBG, Kew. Database increased	180 samples (in triplicate) collected and classified. Three field trips carried out and samples added to the Darwinion IRIS database, accessible through the internet. Total Misiones species on database is currently 2,892	Continue these works, establish and control of study sites
Ethnobotanical studies with Guaraní people, integrated to qualified roles, livelihood	Ethnobotanical knowledge of region and sustainable livelihood plan produced	Guaraní people incorporated to the field work. One scholarship granted	Improve and extend cooperation with collaborators. Devise new sustainable livelihood means

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improvement			
Techniques of restoration and bamboo control produced	Experimental plots installed in infested areas	Not initiated yet	Develop new protocols and establish pilot areas.
Biodiversity assessment and monitoring programme in place	Protocols established and tested	Fauna studies have begun but in the main this output has not been initiated	Develop and test control protocols and field control
Education, training and wide reaching dissemination of information. Including four taught courses in Argentina and four FacFor staff travel to Kew and Eden Project	Articles in partner publications, TV broadcasts and local media. Papers for scientific and conservation communities published	Wide-ranging press coverage of project activities	Extend to a more regular communication schedule, include some national press coverage. Prepare the Int'l Committee coverage
Management plan for YBR produced	Management plan produced		Prepare general elements of a management for Esmeralda Park
Exhibit produced at the Eden Project	Exhibit produced	Interpretation relating to the project has been on display at Eden (exhibit about Guaraní lifestyle in the Core building and posters) and will grow over the coming year	Produce exhibit in 2007

Appendix 1 – Logical framework

Project summary	Measurable Indicators	Means of verification	Important Assumptions
Goal: To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but poor in resources to achieve <ul style="list-style-type: none"> • the conservation of biological diversity, • the sustainable use of its components, and • the fair and equitable sharing of benefits arising out of the utilisation of genetic resources 			
Purpose A strategic sector of the threatened Atlantic Forest protected through a permanent programme of research, training, fieldwork, management plan and Guarani empowerment in the Yabotí Biosphere Reserve (YBR).	Improvement in habitat and species composition knowledge. Forest restoration and bamboo control procedures A stable scientific staff stewarding a well equipped and funded field station assisting MINEC in biodiversity conservation Proposed changes adopted in FacFor graduate and rangers school curricula At least 2 Guarani villages empowered through the partnership, and its income level raised by at least 20% Public awareness campaigns about Misiones forests in Argentina and UK One person obtains PhD as direct result of project work	Peer reviewed articles by key staff, field survey reports and inventories Field survey reports by key staff and publications by partner organisations Integration, functions and reports of the committee FacFor and school curricula reports of activities and income Reports by partner organisations Copies and transcripts of publicity sent to Darwin Certificate of PhD	Appropriate skills in the staff team Continued commitment of partner organisations and regional government Ongoing viability of partner institutions Continued commitment of student
Outputs Institutional framework agreement between staff members and MINEC Funding arrangements agreed Equipping of the field station Inventory of plant species and FacFor herbarium improvement Accumulated data made available on internet through IRIS database Ethnobotanical studies with Guarani people, integrated to qualified roles, livelihood improvement Techniques of restoration and bamboo control produced. Biodiversity assessment and monitoring programme in place Education, training and wide reaching dissemination of information. Including four courses taught in Argentina and four FacFor staff travel to Kew and Eden Project Management plan for YBR produced Exhibit produced at the Eden Project	Agreements reached, funding obtained Equipment incorporated Herbarium collections deposited at FacFor, DARW and RBG, Kew and database increased Ethnobotanical knowledge of Region and sustainable livelihood plan produced. Experimental plots installed in infested areas Protocols established and tested Articles in partner publications, TV broadcasts and local media. Papers for scientific and conservation communities published Existence of management plan Exhibit presence on-site at the Eden Project	Text of the agreement, balances and reports from the field station Database, published articles sent to Darwin Initiative Course outlines, published articles, plan document sent to Darwin Initiative Results from experimental plots evaluated Field reports Copies of all publications, press coverage and recordings sent to Darwin Initiative Management plan sent to Darwin Initiative Exhibit briefs and photographs sent to Darwin Initiative	Continued commitment of partner organisations and regional government Appropriate production skills in staff team Continued assistance from Guarani population Appropriate skills in staff team Continued cooperation of project partners Continued cooperation of project partners Appropriate production skills in staff team

Appendix 2- Papers presented at Scientific Meetings

Paviolo, A. J.; De Angelo, C. y Di Bitetti, M. S. Jaguar (*Panthera onca*) population decline in the Upper Paraná Atlantic Forest of Brazil and Argentina. Oral presentation (Di Bitetti). *19th Annual Meeting of the Society for Conservation Biology*. July 15-19 2005, Brasilia, DF, Brazil.

Di Bitetti, M. S.; A. Paviolo, A. y De Angelo, C. Densidad, uso del hábitat y patrones de actividad del ocelote (*Leopardus pardalis*) en el Bosque Atlántico de Misiones, Argentina. *XX Jornadas Argentinas de Mastozoología*, Buenos Aires, November 8-11, 2005. Oral.

De Angelo, C.; Paviolo, A. y Di Bitetti, M. Criterios cuantitativos multivariados para la identificación precisa de huellas de yaguareté (*Panthera onca*) en relación a especies simpátricas. *XX Jornadas Argentinas de Mastozoología*, Buenos Aires, November 8-11, 2005. Oral. (De Angelo).

Ferrari, C. A.; Paviolo, A.; Di Blanco, Y.; De Angelo, C. y Di Bitetti, M.S. Abundancia, uso del hábitat y patrones de actividad del venado pardo (*M. americana*) y la poca (*Mazama nana*) en la selva paranaense. *XX Jornadas Argentinas de Mastozoología*, Buenos Aires, November 8-11, 2005. Poster.

Paviolo, A.; De Angelo, C. y Di Bitetti, M. Estado de la población de yaguareté (*Panthera onca*) en el Bosque Atlántico de Misiones y las posibles causas de su declinación. *XX Jornadas Argentinas de Mastozoología*, Buenos Aires, November 8-11, 2005. Oral (Paviolo).

Paviolo, A.; Di Blanco, Y.; Varela, D.; De Angelo, C. y Di Bitetti, M. S. "Regional Assessment of the Status of Lowland Tapirs (*Tapirus terrestris*) in the Upper Paraná Atlantic Forest Ecoregion" Third International Tapir Symposium. Buenos Aires, 26-31 enero 2006.

Appendix 3 – Press conference publicity for major partners in Darwin Initiative Project



Conservación de la biodiversidad en la Reserva de Biósfera Yabotí

Enero de 2006

MISIONES



Ministerio de Ecología,
Recursos Naturales
Renovables y Turismo



Gobierno de la
Provincia de Misiones



A forest under threat: does Darwin hold the key?

The sub-tropical forests of Misiones, Argentina, are in serious decline. The once expansive Atlantic Rainforest of Latin America has been decimated throughout Brazil and Paraguay, leaving important, fragile remnants clinging to survival in Misiones.

Dan Ryan
of the Eden
Foundation
Team describes
a journey to
Argentina with
Sir Ghillean
Prance

From the drama of Iguazu in the north and following the 'green corridor' to the south, Misiones is still largely forested and remains a haunting reminder of what has been lost. The Eden Project, through a proposed Darwin Initiative project, is aiming to restore some stability in the form of training and a management plan for the forest. The work will focus on the Yaboti Biosphere Reserve, which has at its core a protected park, Esmeralda. Early funding from the Foreign and Commonwealth Office provided a field-station and the improvement of access into the park. The proposed Darwin Initiative project will use these facilities in the training of local scientists and foresters with the aim of safeguarding the future of these beautiful forests. Many local partners are engaged in the project, from botanical institutes to local government and, perhaps, most importantly the local Guaraní people, for whom the forest is their ancestral home. Survival following the Spanish invasion has always been finely balanced; the Jesuit missions even turned them to Christianity as an escape method.

It is a regional province; a peninsula of sorts, poking splendidly into neighbouring Brazil and Paraguay

But never has their survival been so threatened as now. Approximately 3% remains of this once great forest, and it is vital to conserve what is left. The spectacularly diverse plant communities of Misiones are special in themselves, including the ancient and somewhat forgotten *Araucaria angustifolia* forests, but they also harbour some iconic predators of Latin

America, including the jaguar, puma and legendary harpy eagle, which require extensive, unbroken home ranges. The forest is also famed for its *mariposa*

(Spanish for butterflies) and all around huge but delicate and beautiful *Morpho* and *Heliconius* species brighten the sky.

The province of Misiones, where we spent the majority of our trip, looks rather odd on the map. Geographically it seems to belong to Brazil. Spiritually, this is very definitely not the case, and these geographical perceptions quickly change when you explore at ground level, where the anomalous map placement begins to make perfect sense. The province is bounded perfectly by two great rivers and





is typified by a Mars-like red-soil landscape and luscious vegetation. Apparently, the red soils revert instantly to more standard hues as soon as the border is crossed, and there are few trees left on the other side of the borders. It is a regional province; a peninsula of sorts, poking splendidly into neighbouring Brazil and Paraguay. Significant cultural identity is defined by a pride in the landscapes and close affinities with older, more 'natural' and significantly more sensible ways of life. It is also blessed with one of the most spectacular sights in the natural world, Iguazú Falls. If ever you have the chance to go to Argentina, you must go to Iguazú. It is perhaps the most perfect boundary between nations on the planet, effortlessly dividing Argentina, Brazil and Paraguay and unleashing the power of the Uruguay and Parana Rivers.

The landscapes are incredible, but in places they are horribly scarred. Forest seemingly stretching to the horizon one minute, which feels warm and right, and fragmented and torn the next. Destroyed by men, eager to plunder the forests and grow crops on the fragile soils, the majestic forests of Misiones are disintegrating at an unsustainable rate and heading the same way as those of their neighbours. To be sure, we in the developed world have made mistakes, and I suppose we wrote most of the books on tropical destruction. But there is a flicker of hope here in Misiones which deserves some cleverer thinking...

If cleverer thinking is applied to this very special region of Latin America and followed up with action, the lives of an ancient group of people will be maintained and some glorious, diverse wildlife and landscapes will endure. I was astounded by what we saw. So many pretty butterflies and other insects, soaring birds of prey, energetic hummingbirds, lizards, gorgeous flowers, towering trees and perhaps my favourite, the skulking Jaguarundi. This big cat (sometimes called the otter cat) is a very strange looking beast about the size of a large dog with a silken, charcoal-tinged brown coat. We were fortunate enough to see one bounding down a remote road before springing into the forest edge. We would have seen it for longer, and in more detail, if Mario (the Argentinean project manager) hadn't neglected his driving in an effort to extract his camcorder from somewhere deep on his person.

It is not only the loss of forest that threatens these creatures. A more immediate threat is poachers, both native and those who cross the borders from Paraguay and Brazil to finish the job they began in their homelands. Unfortunately,

The landscapes are incredible, but in places they are horribly scarred. Forest seemingly stretching to the horizon one minute, which feels warm and right, and fragmented and torn the next

Opposite: scenes from Misiones (all photos by Dan Ryan).

Below: Sir Ghillean (left), Omar (park ranger, centre) and Dan (foreground) in the forest.

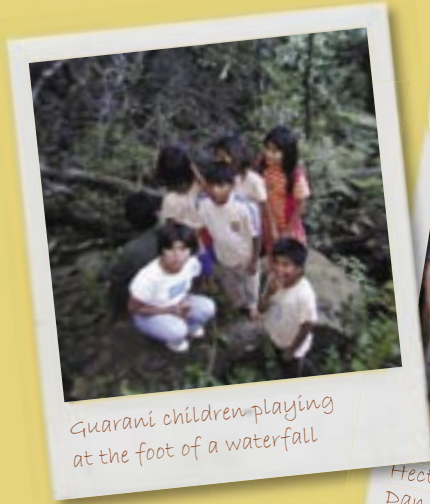
as Ghillean had warned, poachers aren't just a threat to the wildlife. They are a real danger to the tireless people working to protect the forest areas. I went for a late evening walk with Daniel, a forest ranger, on what I believed was a quest for owls and other nocturnal creatures. We didn't find many owls but we did discover three young men, a dog and their machetes. One of the men pulled a gun on us. We ran blindly into the night and three shots were fired. After getting hideously lost I eventually found my way back, relatively unscathed, to the ranger cabin where we were staying. Sadly, Daniel had been hit and was very badly injured, lying not far from where

we had parted. The culprits were caught; the gunman was just 22...

This incident was the only unpleasant aspect of an unforgettable experience. The forest, one of the biodiversity hotspots of the planet and arguably the most threatened in the world, is tilted precariously; it could be ruined by the quest for short-term financial gain, or be preserved as a culturally significant haven. The people who depend on the forest services for their lives can, and should, be helped, for it is they who will be central to the sustainable future of the great Misiones forest. We should all keep a close eye on this little corner of the world, and remember that the plight of Latin American rainforests is not exclusive to the Amazon.

Sir Ghillean Prance's report on the ethnobotanical aspects of the Misiones Forests and their people will be published in the next issue of Friends.





Guaraní children playing at the foot of a waterfall



Hector, Ghillean and far right Dan at the village of Juan Carlos previously unvisited by outsiders



Surveying the forests of Yaboti

A visit to the Yaboti Biosphere

During 2004 my assignments for the Eden Project took me twice to the rainforests of South America and to their indigenous peoples.

by **Professor
Sir Ghillean
Prance**
FRS VMH

I have already reported on the Friends trip to Amazonian Ecuador and the Achuar Indians in issue 16. In October Daniel Ryan and I made a two-week visit to the Province of Misiones in northeastern Argentina to visit the Yaboti Biosphere Reserve and its population of the Guaraní people. The visit was financed by a grant from the UK Darwin Initiative to help us to prepare a more detailed proposal for funding to support the training of staff and the plans for the management of the reserve.

The Yaboti Biosphere Reserve was created in 1993 to preserve the last remaining large tract of the southern Atlantic rainforest, which formerly covered a large area of Brazil, Argentina and Paraguay. In Paraguay very little remains and in Brazil only a few small reserves have been set aside. However, in the Province of Misiones a large area of this forest still remains relatively intact and has been made into one of UNESCO's biosphere reserves and it is vital to encourage its protection. At the centre of the reserve, forming the core area, is

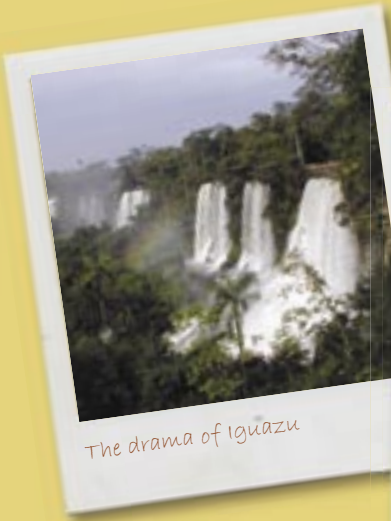
the Esmeralda Provincial Park. Outside this area much of the reserve is privately owned and is in various states of preservation. Some lots still contain pristine forest and others have suffered from over-exploitation of the timber.

Support for the reserve has been provided by the British Embassy in Buenos Aires, Canada and France, and as a result there is an extremely well built facility with work space and accommodation for researchers. I am most pleased that the field station is to be named after Marcio Ayres, a well-known Brazilian biologist who established the international advisory committee for the reserve. He died in March 2004 and richly deserves this recognition.

The Guaraní

After a trying journey involving a delayed flight and subsequent missed connections, we eventually arrived in Yaboti.

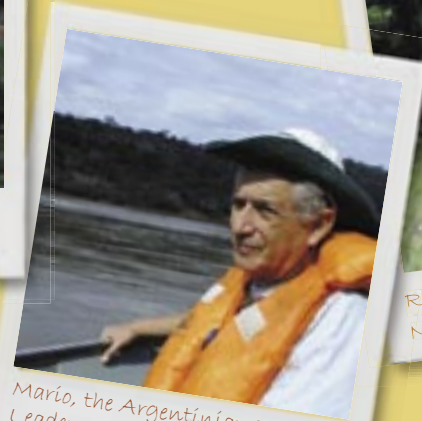
The indigenous people of this area of Argentina and Paraguay are the Guaraní and one of the purposes of our trip was to visit them and to encourage their integration into the management of the reserve. We visited four different villages and gained a good idea of the possibilities. We were most fortunate to be accompanied by Argentinean ethnobotanist Hector Keller, who has studied the Guaraní for several years. He speaks their language fluently and is currently working towards his Ph.D. for



The drama of Iguazu



The landrover would become an entomologist's playground



Mario, the Argentinian Project Leader, admiring the scenery in Iguazu National Park



Recycling in Iguazu National Park

Reserve

which I am acting as one of his supervisors. His doctoral thesis will be an interesting comparison between the Guaraní and the botanists' concepts of vegetation types, which will furnish invaluable data for conservation of the forests.

...because it is surprisingly difficult for the uninitiated to walk along a narrow log with fast flowing water beneath

The first village we visited was outside the boundary of the Yaboti Reserve, but there Hector had worked with the inhabitants to make a 1.5 m interpretative trail through the forest to encourage informed ecotourism. The Guaraní hope that enough paying tourists to assist their economy and help them to preserve the forest will use the trail and also buy some of the baskets, carved animals and other artefacts that they sell. Many of the trees along the trail were labelled and we were told about their uses. There was also an impressive variety of different types of traps to demonstrate the ways in which the Guaraní trap wild animals.

The second village we visited was not far from the biological station but was a 10 km drive along a much overgrown track and a walk down a steep slope. We reached the Little Yaboti River to discover that it was not so little as it had flooded because of the recent heavy

rain. We shouted to the Guaraní across the river to inform them that we would come back the next day instead. A slog up the slopes brought us to the Landrover and back to San Pedro. When we arrived back at the river the next day it was still in flood, but the Guaraní had built an improvised bridge for us to cross over. They had felled a series of trees and strapped them together with vines and had even made a handrail to help us where we might lose our balance, because it is surprisingly difficult for the uninitiated to walk along a narrow log with fast flowing water beneath. Since we had left our shoes on the dry river bank we continued barefoot up the other bank of the river and across a field to the small village. We sat and talked and listened for about two hours. The head of the village agreed to help with the maintenance of some of the trails in the reserve that will be needed by researchers and tourists alike. While we sat with chickens pecking at our bare feet, we were offered the local brew, yerba maté. Maté is a caffeine-rich tea made from a species of the holly genus (*Ilex paraguariensis*). It is brewed in a wooden utensil or a gourd or even a cow's horn cup. The custom throughout Argentina is to pass the cup around while each person takes sips through a communal silver or wooden straw and it is usually made with piping hot water but here the maté was made with cold water so

The strongest message we received from the Guaraní people was concern for the forests that are their livelihood

we were not so certain about the hygiene. We were assured that the spring water which they used was clean and so it must have been since we suffered no ill effects. Later in our trip we visited an area on the south side of the reserve where there were two Guaraní villages. In one a guide walked us through the forest to show us some of the plants they used. We had a most interesting time learning from this very willing and helpful informant. In a short time I had compiled a list of 32 species of plants used by the Guaraní (see box). In the second village we were shown the school and Dan was soon to be seen instructing the children. As we left they were singing one of their songs accompanied by their teacher on a home made violin with wire strings.

The Guaraní people have many problems and live on the edge of Argentinean society, either staying isolated in the forest or becoming more integrated and finding good employment. However, the strongest message we received from them was concern for the forests that are their livelihood. They are most preoccupied about the over-harvesting of timber from their forests. When we were in Pousadas, the provincial capital, for a meeting with the governor and other officials, we were confronted by a delegation of ten Guaraní chiefs who were seeking to deliver a plan to the governor to maintain the integrity of their forests. As the work of the Eden Project in Misiones develops, we will certainly be involved in both ethnobotanical research and the integration of the Guaraní into the management of the reserve.

Overflight of the reserve

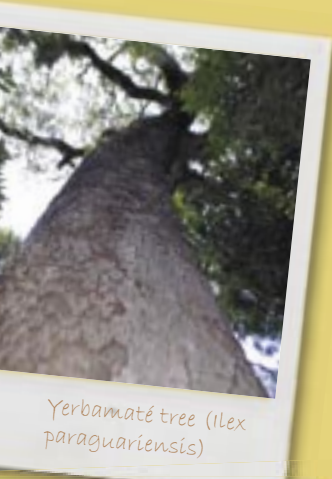
Mario Malajovich arranged for the three members present of the International Advisory Committee to fly over the reserve to get a better perspective of its importance and its structure. We were picked up at Iguazú at the extreme north of the Province and flew to Pousadas in the southwest of Misiones. Fortunately for the first half of our flight, which was over the Yaboti Reserve, we had good weather and so got an excellent idea of the reserves. Two things especially struck me. Firstly the extreme importance of this large area of forest, because to the left we saw Brazil where most of the forest has gone and to the right Paraguay, where there is virtually no forest remaining. Secondly that the forest is under threat from excess timber extraction and tobacco farming. Both these facts reaffirmed my opinion that we were in the right place at the right time when a carefully planned programme

of collaboration could help save much of the forest. After 90 minutes of flight we put down at a Gendamerie station on the Uruguay River to refuel the helicopter. The gendarmes patrol the frontier because one of the threats to the reserve is hunters and settlers from Brazil.

After the helicopter was tanked up we took off again to a much more bumpy onward flight because a storm was coming across the region from the southwest, where we were heading. As a result, after 20 minutes our fortunately cautious pilot landed on the foothill field of a small town to wait out the worst of the storm. We then progressed another 30 minutes flight to Oberá, where we again landed for another 45 minutes and were looked after by the local gendamerie. We arrived in Posadas exactly in time for the meeting with the governor and so had to make a very rapid change of clothes in our hotel before proceeding to the ceremonies.

Meetings and politics

One of the most important aspects of setting up a programme of conservation is the establishment of good political relations. The UNDP co-ordinator of the reserve, Mario Malajovich, has done much to establish a good working relationship between the reserve and the provincial government. We were expected to back this up with a visit to the provincial capital Pousadas to meet with the governor and other authorities. We were rather surprised to be ushered into a large and full classroom in the city conference centre, where I was placed at the head table with other dignitaries. The province's Minister for the Environment, Luis Jacobo, chaired the meeting and I and the other two members of the International Advisory Committee of the reserve were expected to address the audience of politicians, journalists, environmental activists and the ten Guaraní chiefs. I did my talk in Portuguese, which was a good thing considering how badly the translator translated the English of fellow committee member Thomas Lovejoy. My theme was the importance of this last large remaining area of Atlantic forest, to encourage its conservation and sustainable use. International Committee member, Mario Boza, who founded the most successful national park system in Costa Rica, spoke on the Costa Rican example and on the importance of forests just for their contribution to the environment as watersheds, air purifiers, etc. He showed how a small tax on utility and water bills in Costa Rica helps to sustain the forests because both water



Yerbamaté tree (*Ilex paraguariensis*)



Hector collecting botanical samples

One of the most important aspects of setting up a programme of conservation is the establishment of good political relations



village life
Guaraní style

and power come from the forests. Tom Lovejoy, an ornithologist who was creator of the large programme on the dynamics of forest fragments in the Amazon rainforest near to Manaus, Brazil, spoke on how the restoration of the watershed that provides water for New York City in the Adirondack Mountains turned out to be a much cheaper way of providing clean water than the elaborate purification plant that was originally planned.

After the public meeting we were ushered into a smaller room with two provincial ministers and other authorities to meet the Governor of Misiones. As at the first time that I met Governor Rovira in 2003 he was most friendly and courteous. After a few minutes of conversation and short speeches, the governor and I signed a general memorandum of co-operation between the Yaboti Biosphere Reserve and the Eden Project in order to formalise our presence there. This should facilitate our future collaboration with the reserve.

Also during the course of our visit we had the first meeting of the International Advisory Committee of the reserve, which was originally set up at the invitation of the late Marcio Ayres and Mario Malajovich. Since the original chairman, Marcio had died, I was asked to take on the chairmanship of the committee, which I willingly accepted because of the great importance of this reserve. I intend to ensure that we form an active and helpful committee for the reserve, to provide both advice on scientific and conservation matters, and to help leads to the funding required to build up the training of people and the infrastructure of the reserve.

Buenos Aires

The last two days of our visit were spent in the capital city of Buenos Aires. This included a visit to the National Secretary of State for the Environment, to stress to him the importance of the Yaboti Biosphere Reserve. We felt well received and that he listened well to our case. On our last day we visited the Instituto Botánica Darwinion. The Director, Fernando Zuloaga is a grass taxonomist with a world-wide reputation. He agreed to become a member of the International Advisory Committee of the reserve. I spent the morning in their herbarium of dried pressed plants looking at

their collection of the family Proteaceae, which I am currently researching. They have many important collections, some of which were made over 200 years ago. More importantly the institute is carrying out a thorough botanical inventory of the Yaboti Reserve and is placing all the data gathered on a user-friendly computer data base.

Conclusion

After an excellent trip, except for Dan's encounter with poachers (see *Friends* magazine no 18) we felt that the time in Argentina had been well spent and that we should do all we can to support the conservation efforts of the Yaboti Biosphere Reserve and its Guaraní inhabitants. One day we hope to bring an exhibit about the forests of Misiones and its people to you at the Eden Project.

Plants of the Guaraní

During our short time with the Guaraní I was able to collect information about 32 of the plants they use. It was soon obvious that the doctrine of the signatures where a use is suggested by a feature of the plant is prevalent in Guaraní culture. As it was in mediaeval Britain. Here are some examples:

- The orchid *Oncidium pulvinatum* has heart shaped leaves – the pseudobulbs of this plant are used to treat heart problems.
- The palm *Euterpe edulis* whose surface roots look like teeth is used to treat toothache.
- The bamboo *Merostachys clausenii* has stems that look snake-like the outer epidermis of the leaf is used to treat snakebite.
- The vine *Hippocratea andina* has a very hard stem that is hard to cut with a machete – a piece of stem is put into the mate tea of a man to treat impotence and cause erection.
- The young leaflet initiation of the vine resemble the fangs of a snake – the vine is wrapped around the head to treat snakebite.

Some of the other plant uses that we were told about either by Hector Keller or by Guaraní informants were:

- Gaei po (cow's foot) = *Bauhinia furfurcata*. Seven leaves of this species are mixed with mate tea to treat lower back pain. Seven is a magic number for the Guaraní.
- Pōa runicha = *Cabralia cangerana*. A decoction of the bark of this tree in the mahogany family is used by women as a contraceptive.

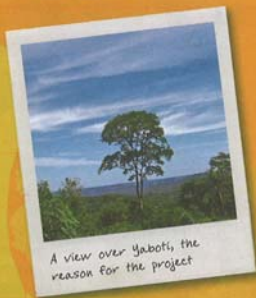
A future for the forests of Misiones? Darwin thinks so!



Auracari: an Angaité forest



Guaraní children, descending through the jungle on vines



A view over Yabotí, the reason for the project

The Darwin Initiative is funding Eden to help conserve one of the most important and most threatened forests on the planet.
Written by Dan Ryan, Partnerships Team

A grant application in 2005 for over £140,000 for three years' work was successful and will provide institutional, scientific, horticultural and educational back-up to an already dedicated but highly under-resourced Argentinean project team.

The sub-tropical rainforests of Misiones, Argentina, are a remnant of the once extensive Atlantic rainforests of South America. Spreading down the Atlantic coast of Brazil into Paraguay and Argentina, deforestation and the intensive agriculture that follows in its wake has left only 5% of this once giant carpet of life intact. One of the world's 'biodiversity hotspots' – a definition signifying the sheer numbers, rarity and brilliance of the wildlife – the largest remaining fragment now lies in northern Argentina in the Province of Misiones. This land is the historical home of the Guaraní people and the forest is critical for the conservation of a culture and a way of life little changed for thousands

of years since they began migrating across the continent from the heart of the Amazon basin.

As with all tropical forests the threats from logging, intensive agriculture and poaching is very real. This project aims to safeguard the forests for the future, protecting not only the wildlife but also the people. Home to thousands of plant species, countless insects and iconic predators such as the jaguar, puma and harpy eagle, the forests of Misiones would be a grave loss to the planet and humanity

As with all tropical forests the threat from logging, intensive agriculture and poaching is very real

if they vanished. Some of the grant has been invested in infra-red camera traps that will provide useful and previously unknown data on the abundance of large forest fauna such as the big cats. Early findings are showing it's not only

the animals that are caught on camera. Unlucky, blundering poachers are caught stalking their prey too...

The main elements of project work are focussed on a protected provincial park, Esmeralda, which is at the heart of the Yabotí Biosphere Reserve. This name evokes strong emotions. For the uninitiated 'Esmeralda' conjures images of a forest paradise, and it's certainly that, with lush forest spanning the horizon, waterfalls meandering through undergrowth, ancient *Dicksonia* tree ferns jockeying for position and swallow-tailed kites spiralling overhead. But, Esmeralda's history is a little darker than the name suggests. The name was given by the previous owners of the land – a large logging company intent on its ruin. What irony that a forest with such an evocative name was ultimately

destined for complete destruction. Yabotí is a UNESCO (United Nations Educational, Scientific and Cultural Organisation) classified Biosphere Reserve under the Man and the Biosphere (MAB) programme. In



Guaraní children the forest stewards of the future



Sun powered field station



A magical Morpho butterfly



Logging is a major threat!

UNESCO's words, Biosphere Reserves are chosen as being representative of their region and to be 'sites of excellence to explore and demonstrate approaches to conservation and sustainable development on a regional scale'. Eden's Darwin Initiative project closely follows the characteristics of these classifications and aims to add new approaches and resources for the continued protection of this realm.

In the heart of Esmeralda a remarkable thing has happened. Through funding from the Foreign and Commonwealth Office a well-equipped, sustainably built field station has been created. Named after the great Brazilian biologist Marcio Ayres, who was a great champion of Yabotí before sadly passing away in 2003, the field station is powered by the sun and is a beautiful pair of wooden buildings equipped with labs, dormitories and living spaces.

This achievement cannot be underestimated. Esmeralda lies in the heart of the forest, at the core of the reserve, and is only accessible in good conditions along a long mud track. Originally the base-camp of the logging company, the field station will give scientists from all over the

Esmeralda lies in the heart of the forest, at the core of the reserve, and is only accessible in good conditions along a long mud track

world prime access to this unique ecosystem. A legacy of the logging enterprise remains in the form of a small plantation of eucalyptus trees and a few ramshackle huts. These eucalypts may be sold in the future to raise revenue for the project but the clearance exercise will also provide the opportunity to regenerate this patch of forest. The Faculty of Forest Sciences has been researching forest regeneration dynamics and this area could be an opportunity to put some of this research into practice. Beatriz Eibl, one of the members of staff at the Faculty of Forest Sciences, University of Misiones, spent the summer on the world-renowned Plant Conservation Strategies course at the Royal Botanic Gardens, Kew. The knowledge Beatriz gained will be immensely valuable to other staff members and students at the Faculty.

While it is humanity that is maybe to blame for the problems in Misiones it is also humanity that can invent and create positive futures for it too. Two

people who have been central to the future of the forests of Misiones are Marcio Ayres and Mario Malajovich. Marcio was a world-renowned Brazilian biologist, and the spearhead for creating the largest protected areas of the Brazilian Amazon. He gathered around him a group of committed people who could carry on his work in Misiones. Among these was Prof. Sir Ghilleen Prance (Eden's Director of Science) and this is Eden's link in the tale. Mario Malajovich turned his hand to conservation late in life but has been instrumental in safeguarding the project from the ravages and twists of Latin American governance. Despite shifts in power he has resolutely held ground and continually fights for what is right for the forest. If the forests of Misiones live on it will be largely due to the dedication of these men and the continued empowerment of the local Guaraní.

The unfolding drama of this project will be told in subsequent issues of the *Friends* magazine.

Appendix 5 – Selected images of wildlife in Yabotí taken with motion sensitive camera traps



'Patudo' – the solitary jaguar caught on film



Family of ocelots



A group of juvenile pumas



Tamandua



White lipped peccaries

Appendix 6 – An example of the herbarium labels accompanying specimens to the Universities of Corrientes, Misiones and the Royal Botanic Gardens, Kew

HERBARIO DEL INSTITUTO DE BOTANICA DEL NORDESTE (CTES)

Corrientes - Rep. Argentina

Solanaceae

Solanum

Det.

Argentina, Misiones, Guaraní.

Loc. Predio Guaraní, 26° 54'-59' S y 54° 12'-18' W. Arroyo Yaguarete Ruzu; Intersección ruta prov. 15 Borde de arroyo

Obs. Arbusto, frutos maduros amarillos. Colección financiada por Darwin Initiative (UK)

Leg. H.A.Keller & G.T.Prance

Fecha 10-1-2006

N° 3286

HERBARIO DEL INSTITUTO DE BOTANICA DEL NORDESTE (CTES)

Corrientes - Rep. Argentina

Polygonaceae

Polygonum punctatum Elliott

Det.

Argentina, Misiones, Guaraní.

Loc. Predio Guaraní, 26° 54'-59' S y 54° 12'-18' W. Arroyo Yaguarete Ruzu; Intersección ruta prov. 15 Borde de arroyo

Obs. Hierba, N.V.:"Ka'a tái". Colección financiada por Darwin Initiative (UK)

Leg. H.A.Keller & G.T.Prance

Fecha 10-1-2006

N° 3287

HERBARIO DEL INSTITUTO DE BOTANICA DEL NORDESTE (CTES)

Corrientes - Rep. Argentina

Begoniaceae

Begonia cucullata Willd.

Det. H.A.Keller, 2006

Argentina, Misiones, Guaraní.

Loc. Predio Guaraní, 26° 54'-59' S y 54° 12'-18' W. Arroyo Yaguarete Ruzu; Intersección ruta prov. 15 Borde de arroyo

Obs. Hierba, flores rosadas, tallos rojizos, N.V.:"Araku ka'a". Colección financiada por Darwin Initiative (UK)

Leg. H.A.Keller & G.T.Prance

Fecha 10-1-2006

N° 3288

HERBARIO DEL INSTITUTO DE BOTANICA DEL NORDESTE (CTES)

Corrientes - Rep. Argentina

Poaceae

Pharus lappulaceus Aubl.

Det. H.A.Keller, 2006

Argentina, Misiones, Guaraní.

Loc. Predio Guaraní, 26° 54'-59' S y 54° 12'-18' W. Arroyo Yaguarete Ruzu; Intersección ruta prov. 15 Borde de arroyo

Obs. Hierba, N.V.:"Ka'i aro". Colección financiada por Darwin Initiative (UK)

Leg. H.A.Keller & G.T.Prance

Fecha 10-1-2006 **N°** 3289

HERBARIO DEL INSTITUTO DE BOTANICA DEL NORDESTE (CTES)

Corrientes - Rep. Argentina

Myrtaceae

Campomanesia guazumifolia (Cambess.) O. Berg.

Det. H.A.Keller, 2006

Argentina, Misiones, Guaraní.

Loc. Predio Guaraní, 26° 54'-59' S y 54° 12'-18' W. Arroyo Yaguarete Ruzu; Intersección ruta prov. 15 Borde de arroyo

Obs. Árbol pequeño, hojas aromáticas, N.V.:"Aracha", "Ñandu apycha". Colección financiada por Darwin Initiative (UK)

Leg. H.A.Keller & G.T.Prance

Fecha 10-1-2006 **N°** 3290

HERBARIO DEL INSTITUTO DE BOTANICA DEL NORDESTE (CTES)

Corrientes - Rep. Argentina

Euphorbiaceae

Sebastiania brasiliensis Spreng.

Det. H.A.Keller, 2006

Argentina, Misiones, Guaraní.

Loc. Predio Guaraní, 26° 54'-59' S y 54° 12'-18' W. Arroyo Yaguarete Ruzu; Intersección ruta prov. 15 Borde de arroyo

Obs. Árbol con látex, frutos con dehiscencia explosiva, N.V.:"Aija". Colección financiada por Darwin Initiative (UK)

Leg. H.A.Keller & G.T.Prance

Fecha 10-1-2006 **N°** 3291